

Docket No. 500.43431X00
Serial No. 10/765,984
Office Action dated April 21, 2006

REMARKS

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I. Introduction

By the present Amendment, claims 1 – 3, 5, 6, 11, and 12 have been amended. Claim 4 has been canceled. Claims 13 – 21 are newly presented for consideration. Accordingly, claims 1 – 3 and 5 – 21 remain pending in the application. Claims 1, 2, 6, 11, and 12 are independent.

II. Office Action Summary

In the Office Action of April 21, 2006, claim 6 was objected to because of an informality. Claims 1 – 3, 8 – 10 and 12 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent 6,490,384 issued to Yong. Claim 7 was rejected under 35 U.S.C. §103(a) as being unpatentable over Yong. Claims 4 and 5 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Published Application 2005/0213877 to Wu, et al. ("Wu") in view of U.S. Published Application 2003/0002782 to Giles, et al. ("Giles"). Claims 6 and 11 were rejected under 35 U.S.C. §103(a) as being unpatentable over Wu. These rejections are respectfully traversed.

III. Claim Objections

Claim 6 was objected to because of an informality. Regarding this objection, the Office Action notes an instance of indefiniteness that appears to have resulted from a clerical error.

By the present Amendment, Applicants have made appropriate corrections to claim 6 to address the informality cited in the Office Action.

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IV. Rejections under 35 USC §102

Claims 1 – 3, 8 – 10, and 12 were rejected under 35 U.S.C. §102(b) as being anticipated by Yong. Regarding this rejection, the Office Action indicates that Yong discloses all of the features recited in these claims such as, an optical switch that comprises a collimator array including a first collimator, a mirror array with a plurality of moveable mirrors, a first mirror, a second mirror, and a collimator. Applicants respectfully disagree.

As amended, independent claim 1 defines an optical switch that comprises:

- a collimator array including a plurality of input collimators and a plurality of output collimators at a same position coupled to optical fibers;

- a mirror array with a plurality of movable mirrors in a common horizontal plane, said mirror array having optically coupled thereto a light leaving said collimator array;

- a first mirror having optically coupled thereto the light leaving said movable mirrors of said mirror array;

- a second mirror having optically coupled thereto the light leaving said first mirror; wherein the light leaving said second mirror passes through said first mirror and said mirror array, and optically couples to said collimator array,

- wherein said movable mirrors of said mirror array switch combinations of said output collimators and said input collimators, and

- said mirror array and said first mirror are disposed on collimator side compared to where said collimator array and said optical fiber are coupled in a longitudinal direction of said collimator array, and said second mirror is disposed on said optical fiber side compared to where said collimator array and said optical fiber array are coupled.

According to independent claim 1, the optical switch includes a collimator array including a plurality of input collimators and a plurality of output collimators at a same position is coupled to optical fibers, and a mirror array that has a plurality of movable mirrors in a common horizontal plane. The mirror array is optically coupled to light leaving the collimator array. The optical switch also includes a first mirror that

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is optically coupled to light leaving movable mirrors of the mirror array, and a second mirror optically coupled to light leaving the first mirror. Furthermore, light leaving the second mirror passes through the first mirror and the mirror array. The light optically couples the second mirror to the collimator array. Furthermore, the movable mirrors of the mirror array switch combinations of the output and input collimators. The mirror array and the first mirror are also disposed on the collimator side with respect to where the collimator array and optical fiber are coupled in a longitudinal direction of the collimator array. The second mirror is disposed on the optical fiber side with respect to where the collimator array and optical fiber array are coupled.

According to the arrangement of independent claim 1, an optical path is formed by the mirror array and the first mirror on the side where the collimator array and the optical fiber are coupled. The angle of the optical paths between a line from the collimator array to the mirror array and a line from the first mirror to the second mirror can be reduced. Accordingly, the optical path can be miniaturized because it can be folded almost in the opposite direction. This allows a thin profile optical switch to be realized. See page 23, lines 15-27 of the specification.

Applicants' review of Yong has failed to reveal any disclosure or suggestion for all the features recited in independent claim 1. Yong discloses an optical switching system that modulates two-dimensional optical paths of optical signals from fiber to fiber. The optical switching system provides a two-axes switching capability for the optical signal by utilizing two one-directional modulators. Light leaving the second mirror of Yong does not enter into the input collimator without returning to the first mirror. Additionally, Yong does not appear to disclose the feature of the mirror array and the first mirror being disposed on the collimator side in comparison to where the collimator array and optical fiber are coupled in a

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longitudinal direction of the collimator array. Yong also does not appear to disclose the second mirror being disposed on the optical fiber side with respect to where the collimator array and optical fiber array are coupled.

In response to Applicant's previous arguments, the Office Action indicates that light "passing" can be read to mean passing over or around, and not necessarily through. The Office Action also notes that claims 1 – 3 and 7 – 10 do not recite the feature of light passing "through" as argued in the remarks.

By the present Amendment, Applicants have amended independent claims 1 and 2, in part, to specify that the light passes through the first mirror. In addition to the clarified language of independent claims 1 and 2, Yong also fails to disclose the newly added features (discussed above) of independent claim 1.

It is therefore respectfully submitted that independent claims 1 is allowable over the art of record.

Independent claim 2 defines an optical switch that comprises, in part:

an output unit with a plurality of optical receivers coupled to optical fibers,

wherein the light leaving said second mirror passes through said first mirror and said mirror array and illuminates an optical receiver selected in said output unit.

As previously discussed, the language of independent claim 2 has been amended to clarify the fact that the light passes through the first mirror. The Office Action indicated that this particular feature is not disclosed or suggested by Yong.

It is therefore respectfully submitted that independent claim 2 is allowable over the art of record.

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Independent claim 12 defines an optical switch that comprises, in part:

said mirror array and said first mirror are disposed on collimator side compared to where said collimator array and said optical fiber are coupled in a longitudinal direction of said collimator array, and said second mirror is disposed on said optical fiber side compared to where said collimator array and said optical fiber array are coupled.

As previously discussed with respect to independent claim 1, this particular feature is not disclosed by Yong.

It is therefore respectfully submitted that independent claim 12 is allowable over the art of record.

Claims 3, 7 – 10, 16, 17, and 21 depend from either of claims 1, 2 and 12 and are therefore believed allowable for at least the reasons set forth above with respect to independent claims 1, 2, and 12. In addition, each of these claims introduces novel elements that independently render it patentable over the art of record.

V. Rejections under 35 USC §103

Claim 7 was rejected under 35 U.S.C. §103(a) as being unpatentable over Yong.

Claim 7 depends from independent claim 1, and is therefore believed allowable for at least the reasons set forth above with respect to independent claim 1. In addition, this claim introduces novel elements that independently render it patentable over the art of record.

Claims 4 and 5 were rejected under 35 U.S.C. §103(a) as being unpatentable over Wu in view of Giles.

The cancellation of claim 4 has rendered part of this ground of rejection moots.

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Claim 5 has been amended to depend from independent claim 1.

Accordingly, claim 5 is believed allowable for at least the reasons set forth above with respect to independent claim 1. In addition, this claim introduces novel elements that independently render it patentable over the art of record.

Claims 6 and 11 were rejected under 35 U.S.C. §103(a) as being unpatentable over Wu. Regarding this rejection, the Office Action alleges that Wu discloses an optical switch that includes a collimator array having a plurality of input and output collimators at the same position to collimate the input/output light, a wavelength dispersive element, a first mirror, and a second mirror. The Office Action further alleges that Wu discloses the feature of light leaving the second mirror passing through the first mirror and the dispersive element, and being coupled back into the collimator arrays. The Office Action admits that Wu fails to explicitly disclose that a mirror array having a plurality of movable mirrors is used. However, the dispersive element is interpreted as being equivalent to the mirror array. The Office Action further admits that Wu fails to disclose the location of the second mirror with respect to the optical fiber side. Giles is relied upon for disclosing an optical MEMS reflective device in which a number of embodiments show a region between mirrors extending in a direction of the input fiber side of the collimators more than on the collimator side of the optical signal. Applicants respectfully disagree.

Giles discloses an imaging technique for use with optical MEMS devices. Giles provides a mirror that is disposed on the optical fiber side when compared to the coupled portion. However, Giles fails to disclose a mirror array on the collimator side. There is only one mirror disposed on the collimator side when compared to the coupled portion. According to the arrangement disclosed in Giles, the angle between the optical path from the collimator to the mirror and the optical path from

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the coupled portion to the optical fiber side cannot be reduced, or minimized, as in the claimed invention. Furthermore, even if the optical path were folded (by combining the teachings of Wu and Giles), the thickness of the optical switch could not be reduced to a thin profile as in the current invention.

It is therefore respectfully submitted that independent claim 6 is allowable over the art of record.

Claims 14 and 19 depend from independent claim 6 and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 6. In addition, each of these claims introduces novel elements that independently render it patentable over the art of record.

Independent claim 11 defines a switch system that comprises, in part:

said mirror array and said first mirror are disposed on collimator side compared to where said collimator array and said optical fiber are coupled in a longitudinal direction of said collimator array, and said second mirror is disposed on said optical fiber side compared to where said collimator array and said optical fiber array are coupled.

As previously discussed, this particular feature is simply not shown or suggested by the art of record.

It is therefore respectfully submitted that independent claim 11 is allowable over the art of record.

Claims 15 and 20 depend from independent claim 11 and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 11. In addition, each of these claims introduces novel elements that independently render it patentable over the art of record.

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VI. Conclusion

For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.

If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.


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AUTHORIZATION

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 500.43431X00).

Respectfully submitted,

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